REFERENCE 2

Engineering Standards for U.S. Atomic Energy Commission, Idaho Operations Office, Idaho Falls, Idaho (as revised May 1960) (selected pages)

ENGINEERING STANDARDS

FOR

U. S. ATOMIC ENERGY COMMISSION

IDAHO OPERATIONS OFFICE

Idaho Falls, Idaho

As Revised May, 1960

DESIGN (Cont'd)

2. Special Criteria (Cont'd)

d. Sanitary (Cont'd)

(2) Sewerage and Sewage Treatment Systems (Cont'd)

(b) Treatment Requirements (Permanent Installations)

(1^1) Installations serving 1 to 60 people. Septic tanks to be used (sized for 24 hours retention).

Precast concrete or metal septic tanks are permissible if of adequate size and design. A maximum of three such tanks installed in series is acceptable provided the total volume of the three tanks is equal to or larger than that required for a single tank.

Septic tank effluent must be chlorinated.

Disposal of septic tank effluent permissible:

(a^1) Into leaching pits or basins: (Recommended in porous soils). Size of leaching pit or basin to be determined from percolation studies or from previous usage data for the area involved.

(b^1) Into subsurface disposal beds (fields): Distribution boxes required, with length and size of field designed from percolation tests. This method has limited usage.

(c^1) Into disposal well which goes directly to the water table: This disposal method permissible only in limited areas (impervious soils) and then only if the effluent is filtered before being discharged to the well. (Filters designed on sludge drying bed criteria).

Effluent to the filter and well shall be strongly chlorinated, fed at a rate to produce chlorine residuals of one ppm or more after a 20 minute contact time.

(2^1) Installations serving 50 to 200 people. Imhoff tanks, Clarigesters or similar type units, or primary sedimentation with separate slude digestion facilities (heated) shall be used.

DESIGN (Cont'd)

2. Special Criteria (Cont'd)

d. Sanitary (Cont'd)

(2) Sewerage and Sewage Treatment Systems (Cont'd)

(b) Treatment Requirements (Permanent Installations) (Cor

(2^1) (Cont'd)
Treatment of effluent from the above units shall be similar to that required for treatment of effluent from septic tanks.

Effluent from these units must be chlorinated.

(3^1) Installations serving over 200 people. Complete treatment to be used. Primary units may be Imhoff Tanks, Clarigesters or equivalent units, or plain settling tanks with separate sludge disgestion.

Secondary units may be standard rate trickling filters, or high rate trickling filter with secondary settling (sedimentation) tanks, or intermittent sand filters. It is advisable that filter unit be designed with covers because of the severe winter conditions.

Activated sludge type treatment facilities are not recommended because of the large fluctuation in sewage flows normally encountered. If Imhoff Tanks, or Clarigesters, etc., are not used, separate sludge digestion facilities will be required. Heating of separate sludge digestion units is desirable.

(4^1) Installations serving 50 to 1000 people. Lagoons (oxidation ponds) are permissible for use in areas having impervious type soils. Approval for their use on any site location must be obtained from IDO.

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Design of lagoons to follow design criteria as stated in Appendix J.

(c) The American Standard Plumbing Code ASA-A40-8 latest revision, shall be used as guides in the installation of all plumbing or plumbing systems.

DESIGN (Cont'd)

2. Special Criteria (Cont'd)

d. Sanitary (Cont'd)

(2) Sewerage and Sewage Treatment Systems (Cont'd)

(d) Standard plans for sewer manholes and covers are shown on IDO Drawing No. Misc. -301-IDO-7, listed in Appendix F. Minimum sewer depth shall be five feet. Manhole spacing shall not exceed 400 feet for sewers smaller than 18 inches in diameter and 600 feet for sewers 18 inches or larger in diameter. Minimum size of sewer mains shall be eight inches. Concrete pipe shall be used for all sewer and drain lines over 18 inches in diameter, except in buildings. Bell and spigot vitrified clog sewer pipes shall be used for sewer lines 18 inches in diameter and smaller unless otherwise approved by IDO.

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e. Heating, Ventilating and Mechanical

(1) Outside design temperatures shall be minus 20°F. for heating loads and 91°F. dry bulb; 55°F. wet bulb for cooling loads. Total annual degree days is 8500.

/R (2) All preheat coils shall be sized to suit the outside design temperature of -20°F. but should be installed and protected so they will not freeze up during relatively short periods of air temperatures as low as -45°F. Do not oversize as this increases their susceptability to freezing in mild weather. Arrange ductwork and piping as follows:

(a) Recirculation minimizes freeze-up and should be provided on all systems where it will not spread contamination or objectionable fumes. Return air should be introduced far enough upstream so it will be thoroughly mixed with the fresh air by the time it reaches the preheat coil. If this is not possible mixing baffles must be provided to prevent air stratification.

(b) Each preheat coil shall be provided with a two-position steam control valve in parallel with the modulating valve. An outside air thermostat shall be installed to hold this valve open at all times when the outside air temperature is +35°F. or lower.

Appendix

SUGGESTED MINIMUM DESIGN CRITERIA FOR SEWAGE LAGOONS OR OXIDATION PONDS

Results and observations of experimental lagooning of domestic sewage in several states indicate that the process has application as a practicable method of waste treatment. Lagoons have proven effective in handling domestic sewage from small communities. Significant amounts of trade wastes admixed with domestic sewage have also been treated without difficulty in many instances.

During summer months, lagoon performance shows 80 to 90 percent reductions in unstable organic matter (BOD), exceedingly high reductions in coliform counts, and supersaturated dissolved oxygen conditions. Aerobic conditions exist when there is no ice cover. Anaerobic conditions are common during late winter and early spring before the ice breaks up; ice coverage minimized odor problems during this critical period and treatment has been indicated to be as much as 65 percent BOD reduction under such conditions.

To date, experiences of consulting engineering firms and water pollution control agencies indicate that certain basic design and construction features must be incorporated in the facilities if effective treatment is to be accomplished. The following standards may be considered of a tentative nature; constructive criticism relating to additions, changes and deletions is requested.

1. GENERAL

1.1 Original useable land acquisition should be not less than one (1) surface acre per one-hundred (100) population or population equivalent, or provide for a detention period of 200 days with a maximum depth of five feet, whichever is greater.

1.2 Only one lagoon need be provided; however, multiple cells in parallel may be utilized to permit more operational flexibility and to maintain optimum liquid levels during both wet and dry cycles.

1.3 Overflowing lagoons (minimum detention, 30 days) may be employed where local conditions and water uses do not negate their development; if an overflowing lagoon is proposed, the original useable land acquisition should be the same as set forth in 1.1 above, to provide space for future expansion or enlargement. These should be considered in a different category from other lagoons.

1.4 The lagoon area should be adequately fenced with a stock-tight fence.

1.5 Appropriate signs should be provided to designate the nature of the facility.

1. GENERAL (Cont'd)

1.6 Lagoon areas should be so shaped that the maximum radius of influence - that distance from the discharge end of the influent pipe to the bank - is obtained, the direction of the prevailing winds not withstanding.

2. LOCATION

2.1 Lagoons should be located approximately 1/4 mile or more from nearest isolated habitation.

2.2 If practicable, lagoons should be located so that local prevailing winds carry possible odors in the direction of non-inhabited areas.

2.3 Locating lagoons in watersheds receiving a significant amount of runoff water is discouraged unless adequate provisions are made for storm water to by-pass the lagoon.

2.4 Proximity of lagoons to wells and underground sources of water supply subject to contamination should be critically evaluated to avoid creation of health hazards and other undesirable conditions. Gravel and limestone are to be avoided unless sealed by an impervious layer.

3. EMBANKMENT AND DIKES

3.1 An embankment of compacted impervious material should be constructed.

3.2 Minimum embankment top width should be 10 feet.

3.3 Maximum embankment slopes should not be steeper than:

(a) Inner, 2-1/2 horizontal to 1 vertical.

(b) Outer, 2 horizontal to 1 vertical.

3.4 Minimum embankment slopes should not be flatter than:

(a) Inner, 4 horizontal to 1 vertical.

(b) Outer, not applicable, except that significant volumes of surface water should not enter lagoon.

3.5 Minimum freeboard should be three feet, plus frost heave.

3.6 Minimum liquid depth should be three feet.

3. EMBANKMENT AND DIKES (Cont'd)

3.7 Maximum normal liquid depth should be five feet. Lagoons with surface areas greater than 10 acres; special consideration will be given to the use of maximum liquid depth greater than five feet.

3.8 Provision should be made for protection of the embankments against all types of corrosion.

4. LAGOON BOTTOM

4.1 The lagoon bottom should be as level as possible at all points. Shallow or feathering fringe areas result in unsatisfactory treatment.

4.2 The bottom should be cleared of all vegetation and debris. Organic material cleared from bottom should not be used in embankment construction.

4.3 Soil formations should be relatively tight to avoid high liquid losses through percolation or seepage. High percolation losses will result in sludge exposures and odor problems. It may be necessary to seal the bottom with bentonite or soil cement.

5. INFLUENT LINES

5.1 Any generally accepted material for lagoon piping will be given consideration, but the material selected should be adapted to local conditions, special consideration being given to the character of the wastes, possibilities of septicity, exceptionally heavy external loadings, abrasion, the necessity of reducing the number of joints, soft foundations and similar problems.

5.2 The influent line into single celled lagoons should be essentially center-discharging. Influent lines into the primary section of multiple-celled lagoons should be essentially center-discharging.

5.3 The discharge end of the influent pipe should be located approximately one foot above the bottom of the lagoon and should not extend to such elevation that ice (shifting) will damage the terminal structure during winter operation.

5.4 The end of the discharge line should rest on a suitable concrete apron, minimum size should be two feet square; larger aprons and proper influent piping supports are necessary to prevent ice damage.

5.5 Influent and effluent piping should, insofar as practicable, be located to minimize short circuiting within the lagoon.

5. INFLUENT LINES

5.6 Manholes or clean-outs are suggested where pipes pass through the embankment. The use of a tee, or wye, to permit pumping liquid from the lagoon to clean the pipe may be desirable.

6. DRAIN LINES

6.1 The lagoon drainage pipe valve should be provided with a lock. Cases have been known where unauthorized persons have opened drainage valves with serious consequences to the owner.

7. INTERCONNECTING PIPING AND OVERFLOWS

7.1 Interconnecting piping and overflows should be of cast iron pipe or corrugated metal pipe of ample size. Use of frost-proof overflow manholes or valve boxes for controlling liquid levels in the lagoon, is encouraged. Enlarged influent lines to such manholes or structures should be at least six to twelve inches off the bottom to control eroding velocities and avoid pick-up of bottom deposits.

7.2 Overflow lines should discharge onto anchored concrete slabs. These lines should be vented if siphoning is developed.

7.3 A suitable pipe should be provided to be employed as a siphon in emergencies that may occur because of overflow piping freeze-up or mechanical stoppages in overflows.

8. INDUSTRIAL WASTES

8.1 Lagoons for industrial waste require special planning and study of the site, and these suggested minimum standards do not apply.

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8.2 Lagooning of wastes containing excessive amounts of oil or other materials and wastes that impart a light color or colloidal content to the sewage should be reviewed by the Board of Health before the design phase is completed.

9. SOILS, PERCOLATION RATES AND GROUND WATER TABLES

9.1 The soil at the lagoon location and at the depth of the bottom of the lagoon should be analyzed and classed as a clay, sandy clay, loam, sandy loam, etc. The samples should be taken at several locations over the proposed areas.

9.2 The rate of percolation at any point in the lagoon or at any point in the dike should not exceed 1/4" per day. With percolation in excess of this rate, consideration should be given to reducing seepage by lining the lagoon and banks with bentonite or other relatively impervious material.